CLAIMS

We claim:

1. An aeration control apparatus for a water filtration system for removing contaminants from well or city main water, comprising:

an aeration tank, having an interior, a water inlet into the interior, a diffuser between the water inlet and the interior, a water outlet from the interior, and a bleed-off tube connecting the tank interior to a drain, which allows water/air to bleed off to the drain;

a source of compressed oxidizing gas;

a first valve;

a second valve downstream of the first valve, wherein the first valve has a first position connecting the source of compressed oxidizing gas to the second valve, the second valve being displaced by gas pressure from the source of compressed oxidizing gas to a first position to open a flow passage between the source of compressed oxidizing gas and the aeration tank, and the first valve has a second position closing the source of compressed oxidizing gas from the flow passage and opening the flow passage to an atmospheric exhaust;

a third valve operated by the opening of the second valve to connect the interior of the aeration tank to the drain; and

a timer operatively connected to the source of compressed oxidizing gas and the first valve and having a first timing state for causing compressed oxidizing gas to flow to the first valve and causing the first valve to assume the first position, the timer having a second timing state for stopping oxidizing gas flow to the first valve and causing the first valve to assume the second position, wherein the timer is operable to repeatedly switch between the first timing state and the second timing state.

2. The apparatus of claim 1 wherein the third valve, in addition to being operable by the opening of the second valve, is responsive to pressure within the interior of the aeration tank, so as to open the bleed-off tube to the drain, independent of the opening of the second valve, the third valve thus functioning as a pressure relief valve.

3. The apparatus of claim 1 wherein the first valve is a solenoid valve.

4. The apparatus of claim 1 wherein the source of compressed oxidizing gas is an air compressor.

5. The apparatus of claim 1 wherein the timer is a programmable controller and wherein the first timer state is less than about four percent of the second timer state.

6. The apparatus of claim 1 wherein the first timer state is maintained for a period of from between about five minutes and about fifteen minutes, and the second timer state is selectable by means of switches to extend for a period of at least approximately four hours.

7. The apparatus of claim 6 wherein the first timer state extends over a period of about ten minutes, and the second timer state is selectable by means of switches to extend for a period of between four and forty-eight hours.

8. The apparatus of claim 1 wherein the second valve further comprises:

a valve piston having a first side exposed to the source of compressed oxidizing gas when the first valve is in the first position, and a second side communicating with the interior of the air tank by way of the bleed-off tube,

a valve stem having a first end engageable by the valve piston, to move the valve stem with the valve piston, the valve stem having a valve seal positioned on a valve seat, the valve seal being opposite the first end, and moving in response to the first end being engaged by the first valve stem, to open the interior of the aeration tank to the drain through the bleed-off tube; and

a biasing member positioned between the valve piston and the valve stem to bias the valve stem into engagement with the valve piston, the valve stem having a pressure receiving surface to cause the valve stem to move against the biasing member forming a pressure relief valve, so that excess pressure within the aeration tank will cause the valve seal to move away from the valve seat so connecting the bleed-off tube to the drain when the second valve is closed, but when pressure in the aeration tank is sufficiently high, to overcome the biasing member and unseat the valve seat from the valve seal.

9. A water filtration apparatus for removing mineral contaminants from well or city main water, comprising:

an aeration tank, having an interior, a water inlet into the interior, a diffuser between the water inlet and the interior, a water outlet from the interior, and a bleed-off tube connecting the tank interior to a drain, the bleed-off tube allows water/air to bleed off to the drain;

an air compressor;

an electric solenoid valve connecting the air compressor to a second valve, the second valve being operable by air pressure from the air compressor, to open a flow passage between the air compressor and the air tank;

a third valve operated by the opening of the second valve to connect the interior of the aeration tank through the bleed-off tube to the drain;

a controller operably connected to the electric solenoid and the air compressor to simultaneously turn the air compressor and the solenoid on and off;

wherein the second valve has a valve piston having a first side exposed to the source of compressed oxidizing gas when the first valve is in the first position, and a second side communicating with the interior of the air tank by way of the bleed-off tube;

a valve stem having a first end engageable by the valve piston, to move the valve stem with the valve piston, the valve stem having a valve seal positioned on a valve seat, the valve seal being opposite the stem first end, and moving in response to the first end being engaged by the valve piston, to open the interior of the aeration tank to the drain through the bleed off tube, a biasing member between the valve piston and the valve stem to bias the valve stem into engagement with the valve piston, the valve stem having a pressure receiving surface to cause the valve stem to move against the biasing member forming a pressure relief valve so that excess pressure within the aeration tank will cause the valve seal to move away from a valve seat so connecting the bleed off tube to the drain when the

second valve is closed, but when pressure in the aeration tank is sufficiently high, to overcome the biasing member and unseat the valve seat from the valve seal.

10. The apparatus of claim 9 wherein the programmable controller is programmed to turn on the solenoid valve and the air compressor for a first period of time followed by turning off the air compressor and solenoid valve for a second period of time at least about 24 times as long as the first period of time.

11. The apparatus of claim 10 wherein the first period of time is about ten minutes, and the second period of time is adjustable between four and forty-eight hours.

12. A method of removing mineral contaminants from a supply of pressurized water from a well or city mains, comprising the steps of:

periodically connecting through an electrically operated solenoid an air compressor to an aeration tank and pumping air into an airhead formed at a top of the aeration cylinder;

using the air pressure from the air compressor on a piston to open a valve to connect the air compressor to the airhead, and through a mechanical linkage connecting a bleed-off tube to a tank drain to control the airhead height within the aeration tank;

periodically, by turning off the electrically operated solenoid, connecting the piston of the valve to an atmospheric vent so that pressure within the aeration tank returns the piston to a position where the valve is closed, simultaneously turning off the air compressor;

venting excess pressure in the aeration tank by applying aeration tank pressure to the mechanical linkage to connect the bleed-off tube to the tank drain;

intermittently simultaneously spraying the entire supply of pressurized water from a well or city mains through a diffuser through the airhead into the aeration tank, and withdrawing aerated water from the aeration tank; and

filtering the aerated water from the aeration tank through a filter to remove mineral contaminants.

13. An aeration tank control valve assembly for mounting to an aeration tank, the assembly comprising:

an aeration head having a base which mounts to an opening in the aeration tank, the aeration head having a water inlet and a water outlet which communicate with the opening in the aeration tank;

a diffuser supported at the base of the aeration head in communication with the water inlet and the aeration tank;

a pick-up tube communicating with the aeration head water outlet and the aeration tank;

a valve housing mounted to the aeration head, wherein portions of the valve housing and the aeration head define a flow passage which communicates with the aeration tank;

a source of compressed oxidizing gas;

a bleed-off tube which extends into the aeration tank and which communicates with the valve housing;

a first valve connected to the valve housing;

a second valve located within the valve housing in communication with the first valve, the second valve having a first position to open communication between the first valve and the aeration tank and a second position to close such communication, wherein the first valve has a first position connecting the source of compressed oxidizing gas to the second valve, and a second position closing the source of compressed oxidizing gas from the flow passage and opening the flow passage to an atmospheric exhaust, the second valve being operated by gas pressure from the source of compressed oxidizing gas to open the flow passage between the source of compressed oxidizing gas and the aeration tank;

a third valve operated by the movement of the second valve and having a first position to open communication between the bleed-off tube and the

drain, and a second position to close communication between the bleed-off tube and the drain; and

a timer operatively connected to the source of compressed oxidizing gas and the first valve and having a first timing state for causing compressed oxidizing gas to flow to the first valve and for causing the first valve to assume the first position, wherein oxidizing gas is directed to the second valve thereby causing the second valve to move to its first position, and the third valve to move to its first position, the timer having a second timing state for stopping oxidizing gas flow to the first valve and allowing system water pressure in the bleed-off tube to cause the second valve to move to its second position, thereby causing the third valve to close communication between the bleed-off tube and the drain, and wherein the timer is operable to repeatedly switch between the first timing state and the second timing state.

14. The assembly of claim 13 wherein the pick-up tube extends through the diffuser into the aeration tank.

15. The assembly of claim 13 wherein the bleed-off tube extends through the diffuser and aeration head.

16. The assembly of claim 13 wherein the source of compressed oxidizing gas is mounted to the valve housing.

17. The assembly of claim 13 wherein the timer is mounted to the valve housing.

18. The assembly of claim 13 wherein the first valve is a solenoid valve.

19. The assembly of claim 13 wherein the source of compressed oxidizing gas is an air compressor.

20. The assembly of claim 13 wherein the timer is a programmable controller and wherein the first timer state is less than about four percent of the second timer state.

21. The apparatus of claim 13 wherein the first timer state is maintained for a period of from between about five minutes and about fifteen minutes, and the second timer state is selectable by means of switches to extend for a period of at least approximately four hours.

22. The apparatus of claim 21 wherein the first timer state extends over a period of about ten minutes, and the second timer state is selectable by means of switches to extend for a period of between four and forty-eight hours.

23. The assembly of claim 13 wherein the second valve further comprises:

a valve piston having a first side exposed to the source of compressed oxidizing gas when the first valve is in the first position, and a second side communicating with the interior of the air tank by way of the bleed-off tube,

a valve stem having a first end engageable by the valve piston, to move the valve stem with the valve piston, the valve stem having a valve seal positioned on a valve seat, the valve seal being opposite the first end, and moving in response to the first end being engaged by the first valve stem, to open the interior of the aeration tank to the drain through the bleed-off tube; and

a biasing member positioned between the valve piston and the valve stem to bias the valve stem into engagement with the valve piston, the valve stem having a pressure receiving surface to cause the valve stem to move against the biasing member forming a pressure relief valve, so that excess pressure within the aeration tank will cause the valve seal to move away from the valve seat so connecting the bleed-off tube to the drain when the second valve is closed, but when pressure in the aeration tank is sufficiently high, to overcome the biasing member and unseat the valve seat from the valve seal.